REMARKS/ARGUMENTS

In the Office Action, the Examiner noted that claims 1-20 are pending in the application. The Examiner additionally stated that claims 1-20 are rejected. By this amendment, claims 1, 3, 7, 9, 15, and 17 are amended. Hence, claims 1-20 are pending in the application.

Applicant hereby requests further examination and reconsideration of the application, in view of the foregoing amendments.

In the Specification

Applicant has amended the specification to secure a substantial correspondence between the claims amended herein and the remainder of the specification. No new matter is presented.

In the Claims

Rejections Under 35 U.S.C. §103(a)

The Examiner rejected claims 1-5, 7-13, and 15-18 under 35 U.S.C. 102(e) as being unpatentable over Mitchell et al., U.S. Patent No. 7,006,943 (hereinafter, "Mitchell") in view of Hussain et al., U.S. Patent No. 6,172,611 (hereinafter, "Hussain"). Applicant respectfully traverses the Examiner's rejections.

In regard to claims 1, 4, 5, 7, 10, 12, 13, 15, and 18, the Examiner remarked that Mitchell discloses a method and apparatus for using an on-board temperature sensor on an integrated circuit or a microprocessor. The Examiner referred Applicant to Figs. 1 and 4, and noted that the device comprises a microprocessor 101, 401, temperature sensor 103 providing on-die thermal monitoring to measure the temperature of the die, temperature limit registers 105, compare logic 107, and cooling device 109 or fan 405. The Examiner noted that Mitchell does not disclose a variable fan control signal directly coupled to an external fan, but that Hussain discloses a fan controller 150 directly coupled to the fan 160 in the same field of endeavor for the purpose of temperature control. The Examiner thus concluded that it would have been obvious to one of ordinary skill in the art at the

time the invention was made to provide the apparatus of Mitchell with a directly coupled fan in view of Hussain so as to control the temperature.

In regard to claims 2, 3, 8, 9, 16, and 17, the Examiner noted that Mitchell discloses the can turn on and off the fan (col. 1, line 19) and control the speed of the fan (co1.5, line 9).

In regard to claim 11, the Examiner remarked that it would have been obvious to one of ordinary skill in the exercise art to substitute the prior art recognized equivalent one for other. In re Fout, 675 F.2d 297, 301, 213 USPQ 532, 536 (CCPA 1982).

Regarding claims 6, 14, 19, and 20, the Examiner pointed out that Hussain discloses a temperature sensor that is remote from or external to thermal management IC 140 in the same field of endeavor for the purpose of temperature control.

Applicant respectfully disagrees with the Examiner's characterization of the teachings of both Mitchell and Hussain vis-à-vis the invention as recited in the claims. Accordingly, the following points are offered in traversal of the rejections.

Claim 1 as herein amended is repeated below for ease of reference:

1. A microprocessor with temperature control, comprising:

a microprocessor die with an external interface for externally providing a variable fan control signal; and

fan control logic, provided on said microprocessor die, that provides said variable fan control signal based on temperature information associated with the microprocessor, wherein said variable fan control signal is directly coupled to an external fan to directly control said external fan, and wherein said fan control signal is operative to variably control rotational speed of said external fan.

Applicant respectfully submits that Mitchell fails to teach a *variable* control signal and furthermore Mitchell does not teach or suggest that the variable control signal is directly coupled to an external fan to directly control the external fan. Figure 4 of Mitchell is shown below where it is clearly depicted that signal TALERT is a *binary* signal, not a

variable signal as claimed, that is coupled to an AND gate 407, thus qualifying the GPOn signal that controls fan 405.

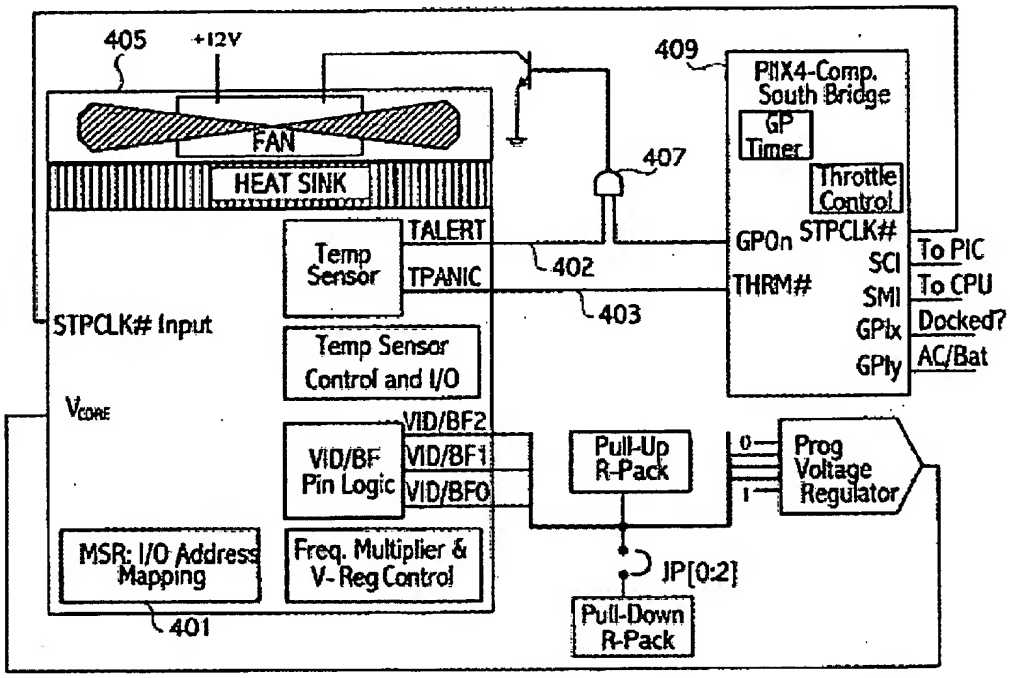


FIG. 4

Mitchell furthermore states that processor 401 supplies TALERT output signal 402, which is coupled to directly control the speed of fan 405 *through AND gate 407.* (col. 5, lines 8-10).

In both thermostat mode and interrupt mode, Mitchell teaches that signal TALERT is asserted a die temperature rises above a value and TALERT is deasserted under other qualifying conditions. This clearly defines TALERT as a binary signal that is only capable of two states. (col. 3, lines 39-57)

Since Mitchell fails to teach, suggest, or even hint that the fan control signal is variable, then it also follows that Mitchell fails to teach that the fan control signal is operative to variably control rotational speed of said external fan.

Hussain teaches that the fan controller 150 is a brushless DC fan controller that is coupled to a brushless DC fan 160. Thus, Hussain does not teach fan control logic, provided on a microprocessor die, that provides a variable fan control signal based on temperature information associated with the microprocessor. Hussain does not contemplate that his brushless DC fan controller 150 could be anything other than a stand-alone device that controls the operation of a brushless DC fan 160 via coupling 152 in a manner known in the art at that time. (col. 5, lines 59-65) Without a doubt, Hussain does not disclose any suggestion that might motivate one skilled in the art to add or otherwise integrate his brushless DC fan controller within the die of a microprocessor. Therefore, he also fails to teach any form of fan control logic that is provided on a microprocessor die, that provides a variable fan control signal based on temperature information associated with the microprocessor.

In view of the arguments submitted above, Applicant respectfully requests that the rejection of claim 1 be withdrawn.

With respect to claims 2-6, these claims depend from claim 1 and add further limitations that are neither anticipated nor made obvious by Mitchell, Hussain, or a combination of Mitchell and Hussain. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections of claims 2-6.

Claim 7 recites substantially the same limitations as have been argued above in traversal of the rejection of claim 1. Accordingly, the Examiner is referred to the points set forth above in traversal of the rejection of claim 1, and it is requested that the rejection of claim 7 be withdrawn.

With respect to claims 8-14, these claims depend from claim 7 and add further limitations that are neither anticipated nor made obvious by Mitchell, Hussain, or a combination of Mitchell and Hussain. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections of claims 8-14.

Claim 15 recites substantially the same limitations as have been argued above in traversal of the rejection of claim 1 as well, the Examiner is referred to the points set forth above in traversal of the rejection of claim 1. In view of these arguments, it is requested that the rejection of claim 15 be withdrawn.

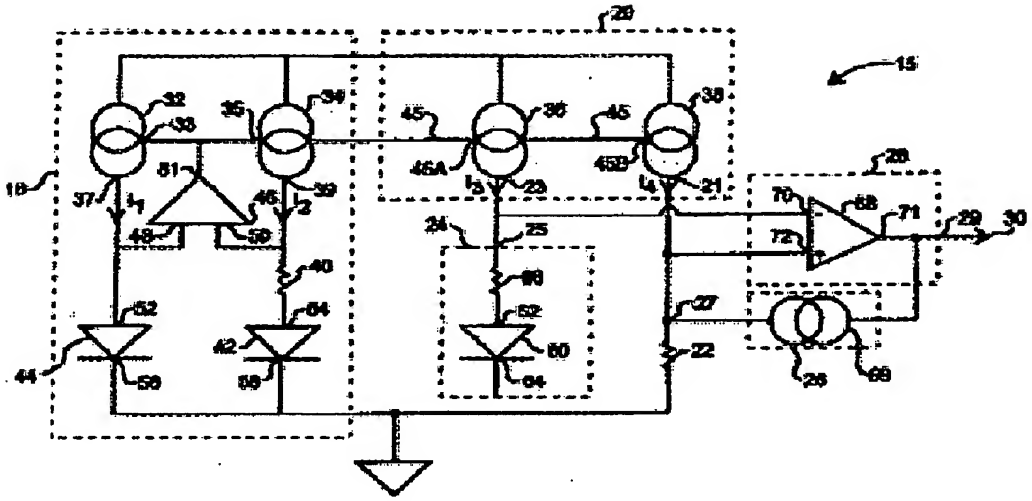
With respect to claims 16-20, these claims depend from claim 15 and add further limitations that are neither anticipated nor made obvious by Mitchell, Hussain, or a combination of Mitchell and Hussain.. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections of claims 16-20.

The Examiner additionally rejected claims 1-5, 7-13, and 15-18 under 35 U.S.C. 103(a) as being unpatentable over Moyal, JP07209091 (hereinafter, "Moyal") in view of Seesemann, U.S. Patent No. 6,384,733 (hereinafter, "Seesemann"). Applicant respectfully traverses the rejections.

With specific reference to claims 1-5, 7-10, 12, 13, and 15-18, the Examiner noted that Moyal discloses a sensing signal generating device for temperature of microprocessor. Referring Applicant to Figs.1 and 2, the Examiner stated that the device comprises a microprocessor 10, temperature sensor 15, and control circuit 28. The temperature sensor 15 is embedded in the integrated circuit. The control circuit controls the fan speed. The temperature sensing elements comprise diodes 42 and 44. The Examiner remarked that Moyal discloses the invention substantially as claimed, but does not disclose fan control nor arrangement. The Examiner added that Seesemann discloses fan device 120 with increase in fan speed at a rising temperature or decrease at a falling temperature in the same field of endeavor for the purpose of cooling the microprocessor. The Examiner concluded that it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the apparatus of Moyal with a fan arrangement in view of Seesemann so as to cool the microprocessor.

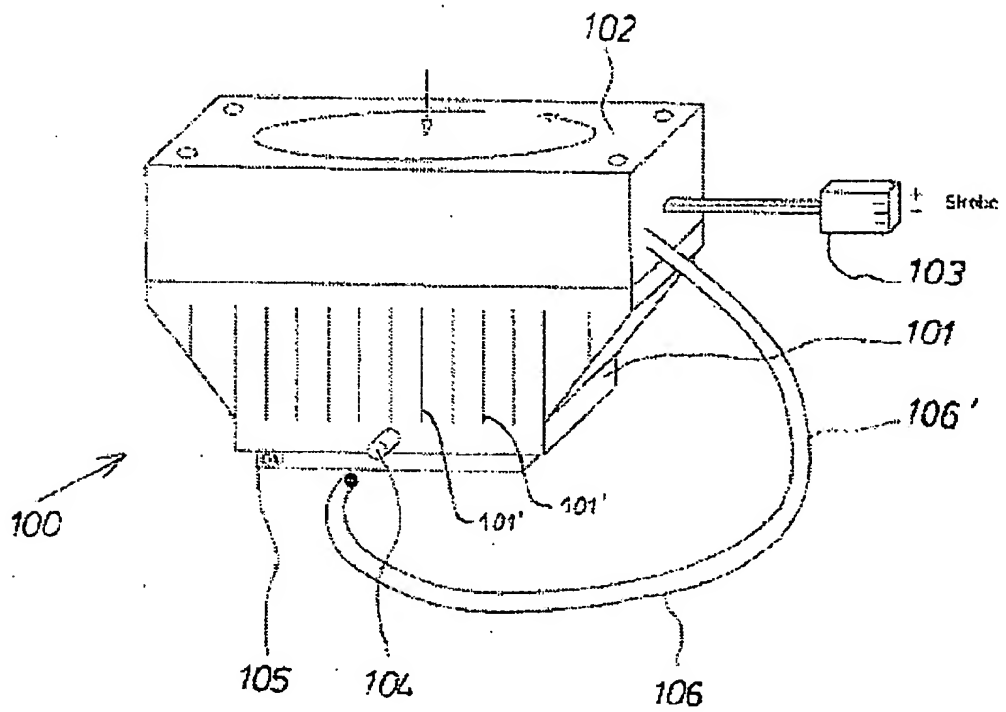
Figure 2 of Moyal is provided below to aid in the following discussion.

【図2】



Applicant notes that Moyal, like Mitchell, fails to teach a *variable* control signal and or that the variable control signal is directly coupled to an external fan to directly control the external fan. Moyal teaches that the control signal is generated by the control circuit, if a temperature signal exceeds a threshold. Furthermore, Moyal specifically teaches that the control circuit 28 that produces the control circuit output 29 is a comparator 68 with added hyteresis, thus clearly teaching that his control signal 29 is a *binary* signal, and not a *variable* signal as is claimed by Applicant. (see paragraph [0030], for example) Moyal does not teach, allude to, suggest, hint at, recommend, or provide any other words or figures which would motivate one skilled in the art to combine teachings that make obvious fan control logic, provided on a microprocessor die, that provides a variable fan control signal based on temperature information associated with the microprocessor, wherein the variable fan control signal is directly coupled to an external fan to directly control the external fan, and wherein the fan control signal is operative to variably control rotational speed of said external fan.

Figure 1 of Seesemann is provided below.



Seesemann teaches a fan 102 with a heat probe 104 embedded into a heat sink 101, where the heat probe 104 acts functionally as a regulator circuit by coupling to the fan 102 via lines 106, 106' (col. 2, lines 21-37), but Seesemann specifically notes that to increase or decrease the speed of the fan device 102, another regulator circuit is required (col. 2, lines 48-52). Seeseman does not teach the composition of signals 106, 106', or how a separate regulator circuit would increase or decrease the fan speed. Seesemann certainly fails to teach that his fan control might be embedded within a microprocessor die. He thus teaches one of the conventional methods for cooling a microprocessor, that is, attaching a fan to a heat sink, and indirectly controlling the fan by sensing the temperature of a heat sink that is mechanically coupled to the microprocessor.

Since Moyal fails to teach a variable control signal and that the variable control signal is directly coupled to an external fan to directly control the external fan, and since Seeseman fails to teach any type of microprocessor die-base fan control, it does not follow that Moyal can be combined with Seesemann to render obvious the limitations of

claims 1, 7, or 15. Consequently, Applicant requests that the rejections of claims 1, 7, and 15 be withdrawn.

With respect to claims 2-5, 8-10 and 12-13, and 16-18 these claims depend from claims 1, 7, and 15, respectively, and add further limitations over that which has been argued above as being allowable over the cited references. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections of claims 2-5, 8-10 and 12-13, and 16-18.

The Examiner also rejected claims 6, 14, and 19-20 under 35 U.S.C. 103(a) as being unpatentable over Moyal/Seesemann as applied to claims 1, 7, and 15 above, and further in view of Hussain. Applicant respectfully traverses and notes that neither Moyal, Seesemann, nor Hussain teach, suggest, or allude to a variable control signal, variable fan control logic within a microprocessor die, or a variable control signal produced by fan control logic within a microprocessor die that is directly coupled to an external fan to directly and variably control the external fan. Therefore, it is requested that the rejections of claims 6, 14, and 19-20 be withdrawn.

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CONCLUSIONS

In view of the arguments advance above, Applicant respectfully submits that claims 1-20 are in condition for allowance. Reconsideration of the rejections is requested, and allowance of the claims is solicited.

Applicant earnestly requests that the Examiner contact the undersigned practitioner by telephone if the Examiner has any questions or suggestions concerning this amendment, the application, or allowance of any claims thereof.

I hereby certify under 37 CFR 1.8 that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office on the date of signature shown below.

Respectfully submitted,
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